

**Call up #7 against Standing Offer W7711-037898
CR 2008-086**

Speech Communication in Noise

**Prepared by Garry Dunn
Trellis Consulting
73 Scarlett Line
Hillsdale, Ontario
L0L 1V0
905-302-7273**

Contract #W7711-037898/001/TOR

**Scientific Authority: Dr. Sharon M. Abel
Individual Readiness Section
DRDC Toronto
1133 Sheppard Avenue West
Toronto, Ontario
M3M 3B9
Tel: 416-635-2037**

13 May 2008

© Her Majesty the Queen in Right of Canada, as represented by the Minister of National Defence, 2008

© Sa Majesté la Reine (en droit du Canada), telle que représentée par le ministre de la Défense nationale, 2008

Abstract

This report describes work performed by Trellis Consulting on Callup #7 against Standing Offer #W771-037898 during the months of January to March of 2008 DRDC Toronto. A set of DVDs created of existing DAT noise loops were calibrated to give the same resultant noise spectra in the Noise Simulation Facility. As well, normalized CDs were created for an external source to use. Familiarity with the QuietProTM system was also acquired.

Résumé

Le présent rapport décrit les travaux effectués par Trellis Consulting dans le cadre de la commande subséquente n° 7 à l'offre à commandes n° W771-037898 durant les mois de janvier à mars 2008 à RDDC Toronto. Un jeu de DVD créés à partir de boucles de bruit sur bande audionumérique ont été étalonnés de manière à produire le même spectre de bruit résultant dans l'installation de simulation du bruit. De même, des CD normalisés ont été créés pour utilisation par une source externe. On s'est également familiarisé avec le système QuietPro^{MC}.

Executive Summary

During this seventh call up against Standing Offer W7711-037898, the DVD loops created previously were calibrated in the Noise Simulation Facility of DRDC Toronto to give identical frequency spectra as the original DAT loops. This was imperative to achieve so that the noise loops accurately represented the original recordings. Normalized CDs were also created to give the best possible fidelity to external consultants for their testing purposes. Additionally, the capability of Nacre QUIETPRO™ communications earplugs was investigated in preparation for laboratory trials.

Sommaire

Dans le cadre de cette septième commande subséquente à l'offre à commandes n° W7711-037898, les boucles sur DVD créées antérieurement ont été étalonnées dans l'installation de simulation du bruit de RDDC Toronto de manière à donner le même spectre de fréquences que les boucles originales sur bande audionumérique. Il fallait absolument effectuer cet étalonnage pour que les boucles de bruit représentent fidèlement les enregistrements originaux. Des CD normalisés ont aussi été créés afin de fournir la meilleure fidélité possible pour les essais exécutés par les consultants externes. De plus, on a analysé la capacité des bouchons d'oreilles pour communications Nacre QUIETPRO^{MC} en vue des essais en laboratoire.

1 Introduction

This document describes the work carried out by Trellis Consulting while working on Call up #7 against Contract # W7711-017898/001/TOR. Originally, this call up covered the 2-month period from 1 January 2008 to 29 February 2007. The call up was extended until March 31, 2007.

The main objective of this Call up was to convert the library of audio tapes in DRDC Toronto's Noise Simulation Facility's (NSF) to DVD format and provide general technical help pertaining to the facility's audio system.

The Statement of Work also called for:

- a. Expansion and validation of currently available software to run an experiment on speech communication in the Noise Simulation Facility.
- b. Noise recording and calibration of levels as required.
- c. Consultation on the purchase of equipment for the measurement of noise and computer hardware/software in support of psychoacoustic experimentation and signal processing.
- d. Cross checking of acoustics devices against DAs
- e. Assistance with the analysis and interpretation of noise dosimetry data previously collected during field trials

2 Tasks Performed

The following sections describe the work performed under this Call up.

2.1 *Calibration of DVDs*

A newly purchased DVD player for use in the NSF outputs audio signals at levels that are different from those output by all the other existing noise sources in the facility. This meant that numerous level measurements had to be made in order to get a properly calibrated signal coming from the DVD player. Special purpose noise CD's were created to assist in analyzing the level from the DVD player. Ultimately, the proper levels were found and 4 hour DVD's of each noise source were recorded and added to the noise library. These included recordings of:

- Aurora
- Leopard Tank
- Griffon
- Sea King
- Hercules (Load Master position)
- Hercules (Flight Engineer position)

2.2 *Normalized CD Creation*

There was also a requirement to create a separate set CDs for use in an external research facility. Since the capability of the audio system in that facility had not been specified, it was necessary to provide the highest possible signal to noise ratio on the CDs. To this end, normalized versions of the CD's were created. The noise spectra of each source was also provided with the CDs to allow for proper calibration.

2.3 *Nacre QUIETPRO™ Communications Earplugs*

During this Call up two sets of Nacre Quietpro communications earplugs were purchased for laboratory trial. In order to understand the capability of this device which is being considered for purchase by the CF there was a requirement to attend a demonstration by the distributor. Instruction was provided on the capability and various features of this device and methods of fitting.

3 Recommendations for Future Technical Work

In order to continue with the lines of experimentation detailed above and based on an assessment of the work completed to date, the following requirements are foreseen:

1. Expansion and validation of currently available software in the Noise Simulation Facility to model auditory overload in a CF vehicular command post.
2. Noise recording and calibration of levels as required.
3. Consultation on the purchase of equipment for the measurement of noise and computer hardware/software in support of psychoacoustic experimentation and signal processing.
4. Cross checking of acoustics devices against DAs

UNCLASSIFIED

DOCUMENT CONTROL DATA (Security classification of the title, body of abstract and indexing annotation must be entered when the overall document is classified)		
1. ORIGINATOR (The name and address of the organization preparing the document, Organizations for whom the document was prepared, e.g. Centre sponsoring a contractor's document, or tasking agency, are entered in section 8.) Publishing: DRDC Toronto Performing: Garry Dunn, Trellis Consulting, 73 Scarlett Line, Hillsdale, Ont. L0L1V0 Monitoring: DRDC Toronto Contracting: DRDC Toronto		2. SECURITY CLASSIFICATION (Overall security classification of the document including special warning terms if applicable.) UNCLASSIFIED
3. TITLE (The complete document title as indicated on the title page. Its classification is indicated by the appropriate abbreviation (S, C, R, or U) in parenthesis at the end of the title) Speech Communication in Noise (U) (U)		
4. AUTHORS (First name, middle initial and last name. If military, show rank, e.g. Maj. John E. Doe.) Garry Dunn		
5. DATE OF PUBLICATION (Month and year of publication of document.) May 2008	6a NO. OF PAGES (Total containing information, including Annexes, Appendices, etc.) 6	6b. NO. OF REFS (Total cited in document.)
7. DESCRIPTIVE NOTES (The category of the document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of document, e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.) Contract Report		
8. SPONSORING ACTIVITY (The names of the department project office or laboratory sponsoring the research and development – include address.) Sponsoring: Tasking:		
9a. PROJECT OR GRANT NO. (If appropriate, the applicable research and development project or grant under which the document was written. Please specify whether project or grant.) 16KL02		9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.)
10a. ORIGINATOR'S DOCUMENT NUMBER (The official document number by which the document is identified by the originating activity. This number must be unique to this document) DRDC Toronto CR 2008–086		10b. OTHER DOCUMENT NO(s). (Any other numbers under which may be assigned this document either by the originator or by the sponsor.) Standing Offer W7711–037898 (Call up #7)
11. DOCUMENT AVAILABILITY (Any limitations on the dissemination of the document, other than those imposed by security classification.) Unlimited distribution		
12. DOCUMENT ANNOUNCEMENT (Any limitation to the bibliographic announcement of this document. This will normally correspond to the Document Availability (11). However, when further distribution (beyond the audience specified in (11) is possible, a wider announcement audience may be selected.)) Unlimited announcement		

UNCLASSIFIED

UNCLASSIFIED

DOCUMENT CONTROL DATA

(Security classification of the title, body of abstract and indexing annotation must be entered when the overall document is classified)

13. **ABSTRACT** (A brief and factual summary of the document. It may also appear elsewhere in the body of the document itself. It is highly desirable that the abstract of classified documents be unclassified. Each paragraph of the abstract shall begin with an indication of the security classification of the information in the paragraph (unless the document itself is unclassified) represented as (S), (C), (R), or (U). It is not necessary to include here abstracts in both official languages unless the text is bilingual.)

(U) This report describes work performed by Trellis Consulting on Callup #7 against Standing Offer #W771-037898 during the months of January to March of 2008 DRDC Toronto. A set of DVDs created of existing DAT noise loops were calibrated to give the same resultant noise spectrum in the Noise Simulation Facility. As well, normalized CDs were created for an external source to use. Familiarity with the QuietPro™ system was also acquired.

(U) Le présent rapport décrit les travaux effectués par Trellis Consulting dans le cadre de la commande subséquente no 7 à l'offre à commandes no W771 037898 durant les mois de janvier à mars 2008 à RDDC Toronto. Un jeu de DVD créés à partir de boucles de bruit sur bande audionumérique ont été étalonnés de manière à produire le même spectre de bruit résultant dans l'installation de simulation du bruit. De même, des CD normalisés ont été créés pour utilisation par une source externe. On s'est également familiarisé avec le système QuietProMC.

14. **KEYWORDS, DESCRIPTORS or IDENTIFIERS** (Technically meaningful terms or short phrases that characterize a document and could be helpful in cataloguing the document. They should be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location may also be included. If possible keywords should be selected from a published thesaurus, e.g. Thesaurus of Engineering and Scientific Terms (TEST) and that thesaurus identified. If it is not possible to select indexing terms which are Unclassified, the classification of each should be indicated as with the title.)

(U) noise in CF environments

UNCLASSIFIED